WMAP Satellite findings from the CBR fluctuations (Wilkinson Microwave Anisotropy Probe)

"For cosmology, this announcement represents a rite of passage from philosophical uncertainty to precision science. Every astronomer will remember where he or she was when they first heard the WMAP results."

John Bahcall, Institute for Advanced Study, Princeton, N.J.

1) WMAP's increased accuracy over the first CBR fluctuation satellite (COBE, 1992) was tremendous–45x the sensitivity and 33x the spatial resolution.
   - (Older fluctuations are smaller)
   - Fluctuations in pressures and temperatures resulted from oscillations between gravitational pull of early plasma against outward light pressure

2) Age of the Universe improved from 14 ± ½ billion years to 13.7 ± 0.14billion years–an "unprecedented" accuracy of 1%.

3) Confirm an inflationary period during which small fluctuations in density were stretched to cosmic sizes denser regions in which galaxies formed, starting the path to the galaxy, galaxy clusters, galaxy superclusters and voids hierarchy observed in today's universe.

4) Determined the age of the great decoupling of matter and light–380,000 years, close to what had been thought.

5) Determined the age when stars began to significantly light the universe–200 million years age–about 5 times earlier than had been thought. This is interesting because the earliest observed galaxies and quasars date to 800 million years after the beginning. The WMAP results tell us there must be many more galaxies and quasars beyond what we currently see.

6) The universe's composition has been much better quantified.

Ordinary matter:	4%	
Dark matter:	23%	
Dark energy:	73%	D.E. is the source of the acceleration in the expansion.

7) The overall import: The results support the standard Big Bang/Inflationary cosmological model that has been growing in consensus over the past 25 years.